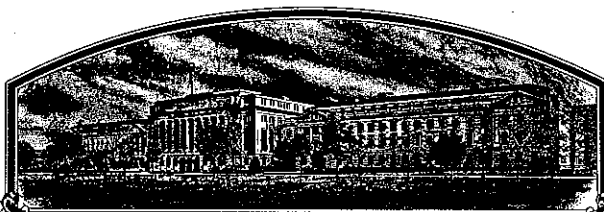


No.

8600132



THE UNITED STATES OF AMERICA

TO ALL TO WHOM THESE PRESENTS SHALL COME:

Pioneer Hi-Bred International, Inc.

Whereas, THERE HAS BEEN PRESENTED TO THE
Secretary of Agriculture

AN APPLICATION REQUESTING A CERTIFICATE OF PROTECTION FOR AN ALLEGED NOVEL VARIETY OF SEXUALLY REPRODUCED PLANT, THE NAME AND DESCRIPTION OF WHICH ARE CONTAINED IN THE APPLICATION AND EXHIBITS, A COPY OF WHICH IS HEREUNTO ANNEXED AND MADE A PART HEREOF, AND THE VARIOUS REQUIREMENTS OF LAW IN SUCH CASES MADE AND PROVIDED HAVE BEEN COMPLIED WITH, AND THE TITLE THERETO IS, FROM THE RECORDS OF THE PLANT VARIETY PROTECTION OFFICE, IN THE APPLICANT(S) INDICATED IN THE SAID COPY, AND WHEREAS, UPON DUE EXAMINATION MADE, THE SAID APPLICANT(S) IS (ARE) ADJUDGED TO BE ENTITLED TO A CERTIFICATE OF PLANT VARIETY PROTECTION UNDER THE LAW.

NOW, THEREFORE, THIS CERTIFICATE OF PLANT VARIETY PROTECTION IS TO GRANT UNTO THE SAID APPLICANT(S) AND THE SUCCESSORS, HEIRS OR ASSIGNS OF THE SAID APPLICANT(S) FOR THE TERM OF *eighteen* YEARS FROM THE DATE OF THIS GRANT, SUBJECT TO THE PAYMENT OF THE REQUIRED FEES AND PERIODIC REPLENISHMENT OF VIABLE BASIC SEED OF THE VARIETY IN A PUBLIC REPOSITORY AS PROVIDED BY LAW, THE RIGHT TO EXCLUDE OTHERS FROM SELLING THE VARIETY, OR OFFERING IT FOR SALE, OR REPRODUCING IT, OR IMPORTING IT, OR EXPORTING IT, OR USING IT IN PRODUCING A HYBRID OR DIFFERENT VARIETY THEREFROM, TO THE EXTENT PROVIDED BY THE PLANT VARIETY PROTECTION ACT OF 1942, AS AMENDED, 7 U.S.C. 2321 ET SEQ.)

CORN

'PHZ51'

In Testimony Whereof, I have hereunto set
my hand and caused the seal of the Plant
Variety Protection Office to be affixed
at the City of Washington, D.C.
this 31st day of March in
the year of our Lord one thousand nine
hundred and eighty-seven.

Attest:

Kenneth A. Evans
Commissioner
Plant Variety Protection Office
Agricultural Marketing Service

Richard E. Lyng
Secretary of Agriculture

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE

FORM APPROVED: OMB NO. 0581-0055

APPLICATION FOR PLANT VARIETY PROTECTION CERTIFICATE

(Instructions on reverse)

Application is required in order to determine if a plant variety protection certificate is to be issued (7 U.S.C. 2421). Information is held confidential until certificate is issued (7 U.S.C. 2426).

1. NAME OF APPLICANT(S) Pioneer Hi-Bred International, Inc.		2. TEMPORARY DESIGNATION		3. VARIETY NAME PHZ51	
4. ADDRESS (Street and No. or R.F.D. No., City, State, and Zip Code) Plant Breeding Division Department of Corn Breeding PO Box 85, Johnston, IA 50131-0085		5. PHONE (Include area code) 515/270-3300		FOR OFFICIAL USE ONLY PVPO NUMBER 8600132	
6. GENUS AND SPECIES NAME Zea mays		7. FAMILY NAME (Botanical) Gramineae		FILING DATE June 5, 1986 TIME 12:30 <input type="checkbox"/> A.M. <input checked="" type="checkbox"/> P.M.	
8. KIND NAME Corn		9. DATE OF DETERMINATION 1984		FEE RECEIVED AMOUNT FOR FILING \$ 1800 DATE June 5, 1986 AMOUNT FOR CERTIFICATE \$ 200.00 DATE February 19, 1987	
10. IF THE APPLICANT NAMED IS NOT A "PERSON," GIVE FORM OF ORGANIZATION (Corporation, partnership, association, etc.) Corporation				11. IF INCORPORATED, GIVE STATE OF INCORPORATION Iowa	
13. NAME AND ADDRESS OF APPLICANT REPRESENTATIVE(S), IF ANY, TO SERVE IN THIS APPLICATION AND RECEIVE ALL PAPERS Dr. Richard L. McConnell Plant Breeding Division Pioneer Hi-Bred International, Inc. PO Box 85 Johnston, IA 50131-0085				12. DATE OF INCORPORATION May 6, 1926	
14. CHECK APPROPRIATE BOX FOR EACH ATTACHMENT SUBMITTED					
a. <input checked="" type="checkbox"/> Exhibit A, Origin and Breeding History of the Variety (See Section 52 of the Plant Variety Protection Act.)					
b. <input checked="" type="checkbox"/> Exhibit B, Novelty Statement.					
c. <input checked="" type="checkbox"/> Exhibit C, Objective Description of Variety (Request form from Plant Variety Protection Office.)					
d. <input checked="" type="checkbox"/> Exhibit D, Additional Description of Variety.					
e. <input checked="" type="checkbox"/> Exhibit E, Statement of the Basis of Applicant's Ownership.					
15. DOES THE APPLICANT(S) SPECIFY THAT SEED OF THIS VARIETY BE SOLD BY VARIETY NAME ONLY AS A CLASS OF CERTIFIED SEED? (See Section 83(a) of the Plant Variety Protection Act.) <input type="checkbox"/> Yes (If "Yes," answer items 16 and 17 below) <input checked="" type="checkbox"/> No					
16. DOES THE APPLICANT(S) SPECIFY THAT THIS VARIETY BE LIMITED AS TO NUMBER OF GENERATIONS? <input type="checkbox"/> Yes <input type="checkbox"/> No			17. IF "YES" TO ITEM 16, WHICH CLASSES OF PRODUCTION BEYOND BREEDER SEED? <input type="checkbox"/> Foundation <input type="checkbox"/> Registered <input type="checkbox"/> Certified		
18. DID THE APPLICANT(S) PREVIOUSLY FILE FOR PROTECTION OF THE VARIETY IN THE U.S.? <input type="checkbox"/> Yes (If "Yes," give date) <input checked="" type="checkbox"/> No					
19. HAS THE VARIETY BEEN RELEASED, OFFERED FOR SALE, OR MARKETED IN THE U.S. OR OTHER COUNTRIES? <input type="checkbox"/> Yes (If "Yes," give names of countries and dates) <input checked="" type="checkbox"/> No					
20. The applicant(s) declare(s) that a viable sample of basic seeds of this variety will be furnished with the application and will be replenished upon request in accordance with such regulations as may be applicable. The undersigned applicant(s) is (are) the owner(s) of this sexually reproduced novel plant variety, and believe(s) that the variety is distinct, uniform, and stable as required in Section 41, and is entitled to protection under the provisions of Section 42 of the Plant Variety Protection Act. Applicant(s) is (are) informed that false representation herein can jeopardize protection and result in penalties.					
SIGNATURE OF APPLICANT Pioneer Hi-Bred International, Inc.				DATE	
SIGNATURE OF APPLICANT by: <u>Richard L. McConnell</u>				DATE June 3, 1986	

'PHZ51'

14A. Exhibit A. Origin and Breeding History

Pedigree: 814/848)X1111X

Pioneer line PHZ51, Zea mays L., a yellow dent corn inbred, was developed by Pioneer Hi-Bred International, Inc. from the single cross 814 x 848 using the pedigree method of breeding. The progenitors of PHZ51 are proprietary inbred lines of Pioneer Hi-Bred International, Inc. Selfing and selection were practiced within the above cross for six generations in the development of PHZ51 at Johnston, Iowa. During line development, test crosses were made for the purpose of estimating combining ability. Additional hybrid combinations have been evaluated and subsequent generations of the line have been grown and hand pollinated with observations made for uniformity.

PHZ51 has shown uniformity and stability for all traits as described in Exhibit C (form LSGS-470-28) - "Objective Description of Variety". It has been self-pollinated and ear-rowed a sufficient number of generations with careful attention paid to uniformity of plant type to assure genetic homozygosity and phenotypic stability. The line has been increased both by hand and in isolated fields with continued observations for uniformity.

No variant traits have been observed or are expected in PHZ51.

14B. Exhibit B. Novelty Statement for 'PHZ51'

PHZ51 is most similar to the Pioneer proprietary inbred line G50. PHZ51 has yellow anthers whereas G50 has red anthers. PHZ51 also reaches anthesis later than G50. PHZ51 sheds pollen and silks approximately 40 and 70 heat units, respectively, later than G50. These observations were taken in the same experiments at many locations across the Corn Belt.

U.S. DEPARTMENT OF AGRICULTURE
AGRICULTURAL MARKETING SERVICE
LIVESTOCK, POULTRY, GRAIN & SEED DIVISION
BELTSVILLE, MARYLAND 20705

EXHIBIT C
(Corn)

OBJECTIVE DESCRIPTION OF VARIETY
CORN (ZEA MAYS)

NAME OF APPLICANT(S) Pioneer Hi-Bred International, Inc.	FOR OFFICIAL USE ONLY PVPO NUMBER 8600132
ADDRESS (Street and No. or R.F.D. No., City, State, and ZIP Code) Plant Breeding Division Department of Corn Breeding PO Box 85 Johnston, IA 50131-0085	VARIETY NAME OR TEMPORARY DESIGNATION PHZ51

Place the appropriate number that describes the varietal character of this variety in the boxes below.
Place a zero in first box (e.g., or) when number is either 99 or less or 9 or less.

1. TYPE:

1 = SWEET

2 = DENT

3 = FLINT

4 = FLOUR

5 = POP

6 = ORNAMENTAL

2. REGION WHERE BEST ADAPTED IN THE U.S.A.:

1 = NORTHWEST

2 = NORTHCENTRAL

3 = NORTHEAST

4 = SOUTHEAST

5 = SOUTHCENTRAL

6 = SOUTHWEST

7 = MOST REGIONS

3. MATURITY (In Region of Best Adaptability):

(Under "comments" (pg. 3) state how
heat units were calculated)

DAYS FROM EMERGENCE TO 50% OF PLANTS IN SILK

HEAT UNITS

DAYS FROM 50% SILK TO OPTIMUM EDIBLE QUALITY

HEAT UNITS

DAYS FROM 50% SILK TO HARVEST AT 25% KERNEL MOISTURE

HEAT UNITS

4. PLANT:

CM. HEIGHT (To tassel tip)

CM. EAR HEIGHT (To base of top ear)

CM. LENGTH OF TOP EAR INTERNODE

Number of Tillers:

1 = NONE

2 = 1-2

3 = 2-3

4 = > 3

Number of Ears Per Stalk:

1 = SINGLE

2 = SLIGHT TWO-EAR TENDENCY

3 = STRONG TWO-EAR TENDENCY 4 = THREE-EAR TENDENCY

Cytoplasm Type:

1 = NORMAL

2 = "T"

3 = "S"

4 = "C"

5 = OTHER (Specify)

5. LEAF (Field Corn Inbred Examples Given):

Color:

1 = LIGHT GREEN (HY)

2 = MEDIUM GREEN (WF9)

3 = DARK GREEN (B14)

4 = VERY DARK GREEN (K166)

Angle from Stalk (Upper half):

1 = < 30°

2 = 30-60°

3 = > 60°

Sheath Pubescence:

1 = LIGHT (W22)

2 = MEDIUM (WF9)

3 = HEAVY (OH26)

Marginal Waves:

1 = NONE (HY)

2 = FEW (WF9)

3 = MANY (OH7L)

Longitudinal Creases:

1 = ABSENT (OH51)

2 = FEW (OH56A)

3 = MANY (PA11)

Width:

CM. WIDEST POINT OF EAR NODE LEAF

Length:

CM. EAR NODE LEAF

NUMBER OF LEAVES PER MATURE PLANT

6. TASSEL:

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NUMBER OF LATERAL BRANCHES

Branch Angle from Central Spike:

1 = $< 30^\circ$

2 = 30–40°

3 = $> 45^\circ$

Penduncle Length:

CM. FROM TOP LEAF TO BASAL BRANCHES

Pollen Shed:

1 = LIGHT (WF9)

2 = MEDIUM

3 = HEAVY (KY21)

Anther Color:

1 = YELLOW

2 = PINK

3 = RED

4 = PURPLE

5 = GREEN

Glume Color:

6 = OTHER (Specify) _____

Pollen Restoration for Cytoplasm (o = Not Tested, 1 = Partial, 2 = Good)

"T"

"S"

"C"

OTHER (Specify Cytoplasm and degrees of restoration) _____

7. EAR (Husked Ear Data Except When Stated Otherwise):

CM LENGTH

MM. MID-POINT
DIAMETER

GM. WEIGHT

Kernel Rows:

1 = INDISTINCT

2 = DISTINCT

NUMBER

1 = STRAIGHT

2 = SLIGHTLY CURVED

3 = SPIRAL

Silk Color (Exposed at Silking Stage):

1 = GREEN

2 = PINK

3 = SALMON

4 = RED

Husk Color:

FRESH

1 = LIGHT GREEN

2 = DARK GREEN

3 = PINK

DRY

4 = RED

5 = PURPLE

6 = BUFF

Husk Extention: (Harvest Stage)

1 = SHORT (Ears Exposed) 2 = MEDIUM (Barely Covering Ear)

3 = LONG (8–10CM Beyond Ear Tip)

4 = VERY LONG (> 10 CM)

Husk Leaf:

1 = SHORT (< 8 CM)

2 = MEDIUM (8–15 CM)

3 = LONG (> 15 CM)

Shank:

CM LONG

NO. OF INTERNODES

Position at Dry Husk Stage:

1 = UPRIGHT

2 = HORIZONTAL

3 = PENDENT

Taper:

1 = SLIGHT

2 = AVERAGE

3 = EXTREME

Drying Time (Unhusked Ear):

1 = SLOW

2 = AVERAGE

3 = FAST

8. KERNEL (Dried):

Size (From Ear Mid-Point):

MM LONG

MM. WIDE

MM. THICK

Shape Grade (% Rounds)

1 = < 20

2 = 20–40

3 = 40–60

4 = 60–80

5 = > 80

8. KERNEL (Dried) :

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1 Pericarp Color: 1 = COLORLESS 2 = RED-WHITE CROWN 3 = TAN 4 = BRONZE
5 = BROWN 6 = LIGHT RED 7 = CHERRY RED
8 = VARIEGATED (Describe) _____

1 Aleurone Color: 1 = HOMOZYGOUS 2 = SEGREGATING (Describe) _____

3 1 = WHITE 2 = PINK 3 = TAN 4 = BROWN 5 = BRONZE 6 = RED
7 = PURPLE 8 = PALE PURPLE 9 = VARIEGATED (Describe) _____

3 Endosperm Color: 1 = WHITE 2 = PALE YELLOW 3 = YELLOW 4 = PINK-ORANGE 5 = WHITE CAP.

Endosperm Type:

3 1 = SWEET (su1) 2 = EXTRA SWEET (sh2) 3 = NORMAL STARCH 4 = HIGH AMYLOSE STARCH
5 = WAXY STARCH 6 = HIGH PROTEIN 7 = HIGH LYSINE 8 = OTHER (Specify) _____

2 6 GM. WEIGHT /100 SEEDS (Unsize Sample)

9. COB:

2 5 MM. DIAMETER AT MID-POINT

Strength:

2 1 = WEAK 2 = STRONG

Color:

3 1 = WHITE 2 = PINK 3 = RED 4 = BROWN
5 = VARIEGATED 6 OTHER (Specify) _____

10. DISEASE RESISTANCE (0 = Not Tested, 1 = Susceptible, 2 = Resistant, 3 = Tolerant):

2 STALK ROT (Diplodia) 2 STALK ROT (Fusarium) 2 STALK ROT (Gibberella)
2 NORTHERN LEAF BLIGHT 1 SOUTHERN LEAF BLIGHT 1 SMUT (Common)
0 SOUTHERN RUST 2 CORN SMUT (Head) 2 BACTERIAL WILT (Stewart's)
2 BACTERIAL LEAF BLIGHT (GOSS') 1 MAIZE DWARF MOSAIC 0 STUNT
OTHER (Specify) _____

11. INSECT RESISTANCE (0 = Not Tested, 1 = Susceptible, 2 = Resistant, 3 = Tolerant):

2 CORNBORER 0 EARWORM 0 SAPBEETLE 0 APHID
0 ROOTWORM (Northern) 2 ROOTWORM (Western)
0 ROOTWORM (Southern) OTHER (Specify) _____

12. VARIETIES MOST CLOSELY RESEMBLING THAT SUBMITTED FOR THE CHARACTERS GIVEN:

CHARACTER	VARIETY	CHARACTER	VARIETY
Maturity	G50	Kernel Type	G50
Plant Type	G50	Quality (Edible)	NA
Ear Type	G50	Usage	G50

REFERENCES:

U.S. Department Agriculture. Yearbook 1937.

Corn: Culture, Processing, Products. 1970 Avi Publishing Company, Westport, Connecticut. (Numerous Authors)

Emerson, R.A., G.W. Beadle, and A.C. Fraser. A Summary of Linkage Studies in Maize. Cornell A.E.S., Mem. 180. 1935.

The Mutants of Maize. 1968. Crop Science Society of America. Madison, Wisconsin.

Stringfield, G.H. Maize Inbred Lines of Ohio. Ohio A.E.S. Bul. 831. 1959.

Butler, D.R. 1954 - A System for the Classification of Corn Inbred Lines - PhD. Thesis, Ohio State University.

COMMENTS: Heat units are accumulated from daily temperatures as follows:

HI = Maximum air temperature in Fahrenheit, but not greater than 86.

LO = Minimum air temperature in Fahrenheit, but not less than 50.

Heat Units = (HI + LO)/2 - 50, but not less than 0.

14D. Exhibit D. Additional Description of 'PHZ51'

PHZ51 is a yellow dent inbred line of corn, Zea mays L.

As an inbred per se, PHZ51 is similar to the Pioneer proprietary inbred G50. However, there are some distinguishable differences between the two inbreds as stated in Exhibit B. When crossed to the same tester, other differences between these two inbreds include: PHZ51 is 5% higher yielding, carries 5% of the mean more grain moisture at harvest time, is 3% later to shed, has 3% better stalk quality, has 34% better late season plant health, is 3% lower in test weight, is 10% poorer for grain quality, is 4% better for growth after emergence, is 7% taller in plant height and 8% higher eared than G50.

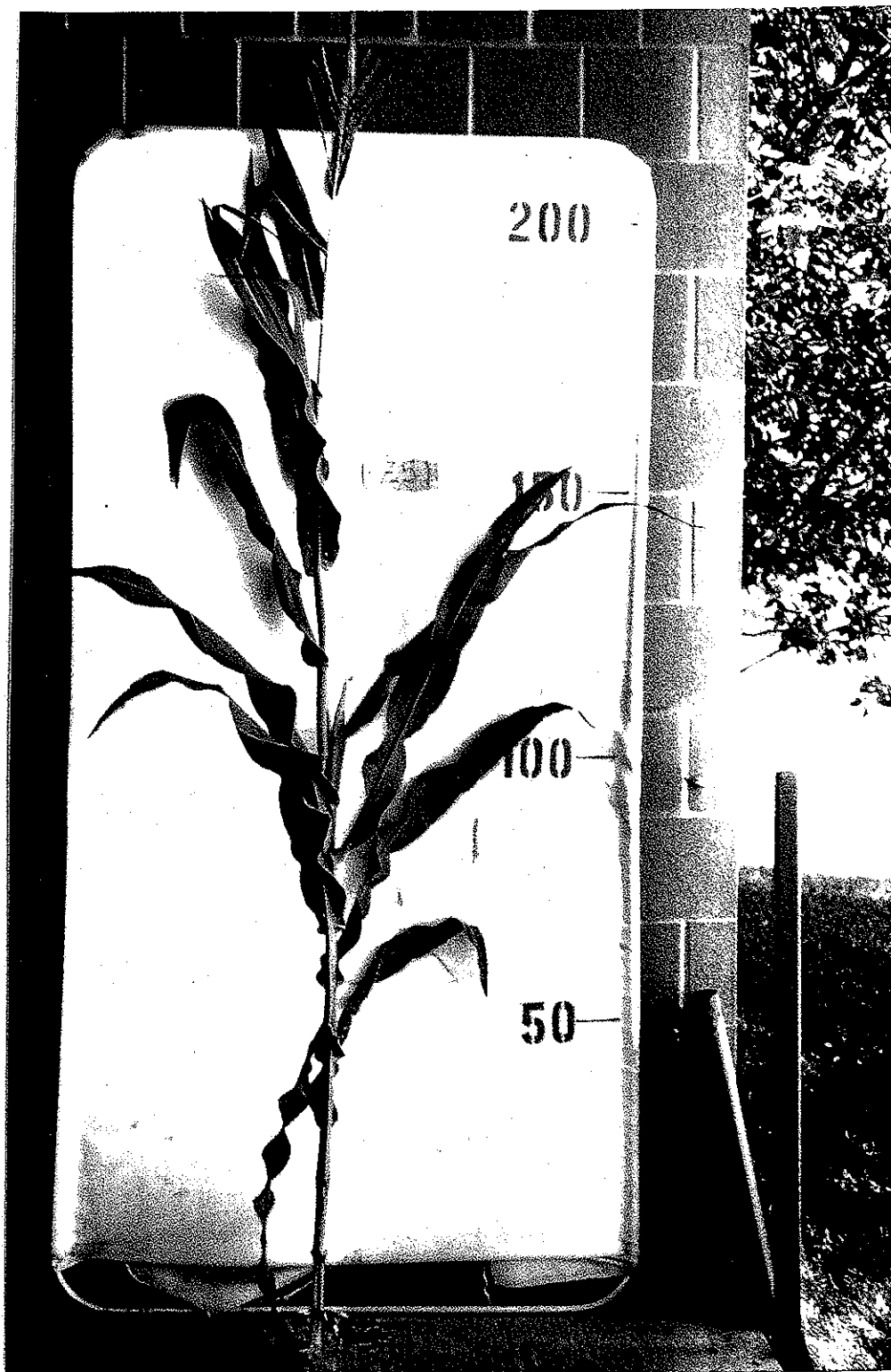
For comparative purposes, data are attached with comparisons of PHZ51 to Pioneer inbred line G50 (crossed to the same tester line and evaluated in the same locations).

14D. Exhibit D. Comparison of PHZ51 and G50 crossed to the same tester line and the hybrids evaluated at the same locations. All values are expressed as percent of the test mean except yield, which is expressed as bushels/acre adjusted to 15.5% grain moisture (1985 data).

	Inbred	Yield	Percent Yield	Moisture	GDU Shed	Stalk Lodging	Root Lodging	Ears/Plot	Stay Green	Test Weight	Grain Quality	Cob Scores	Seedling Vigor	Plant Height	Ear Height		
No. of Reps.		624	624	624	141	603	237	249	366	621	447	114	384	330	330		
	PHZ51	153	103	99	103	106	102	98	133	99	99	103	110	107	107		
	G50	145	98	94	100	103	101	101	99	102	109	110	96	100	99		
Diff.		8	5	5	3	3	1	3	34	3	10	7	4	7	8		

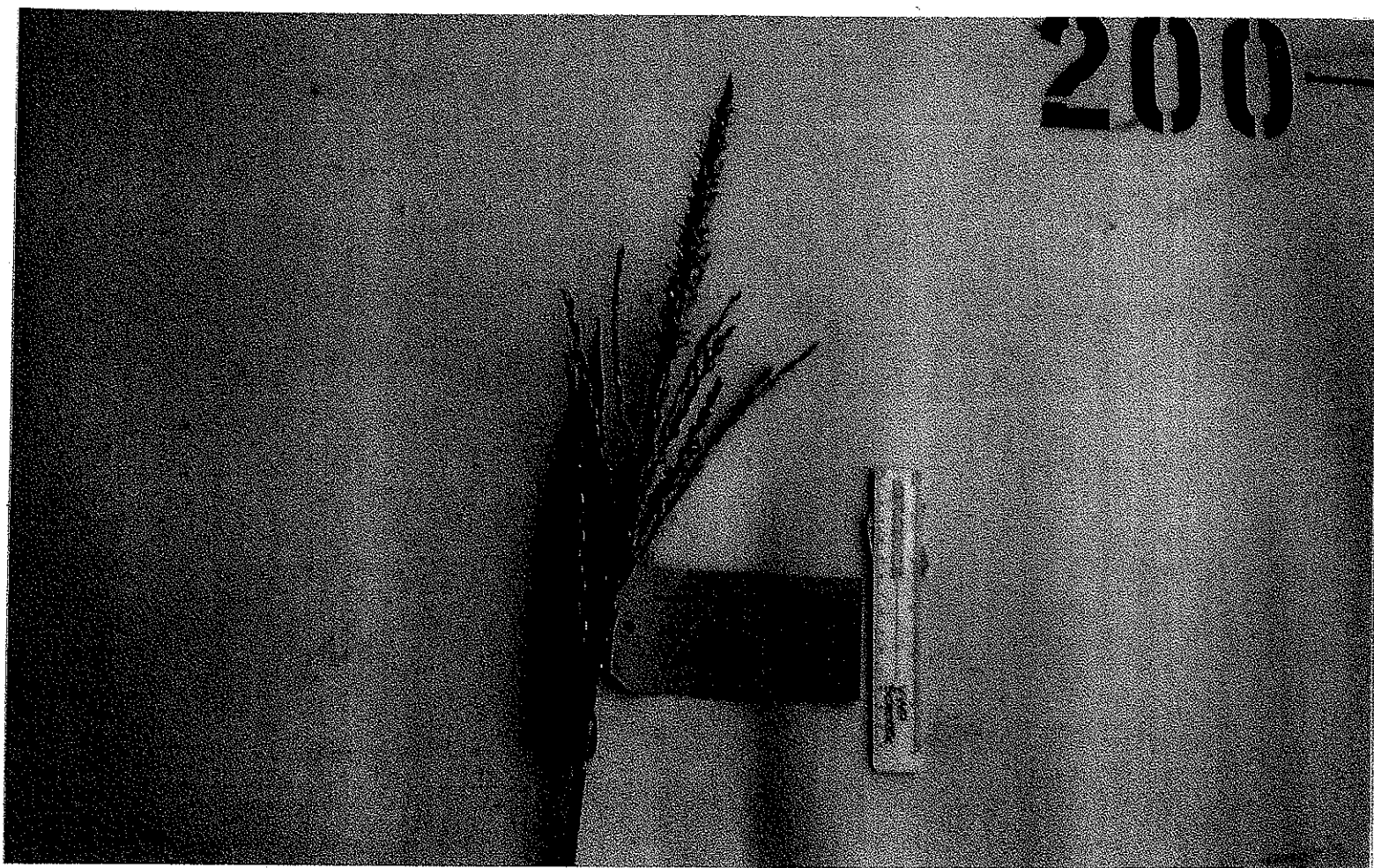
14D. Exhibit D. Additional Description of 'PHZ51' (continued)

a. Whole plant



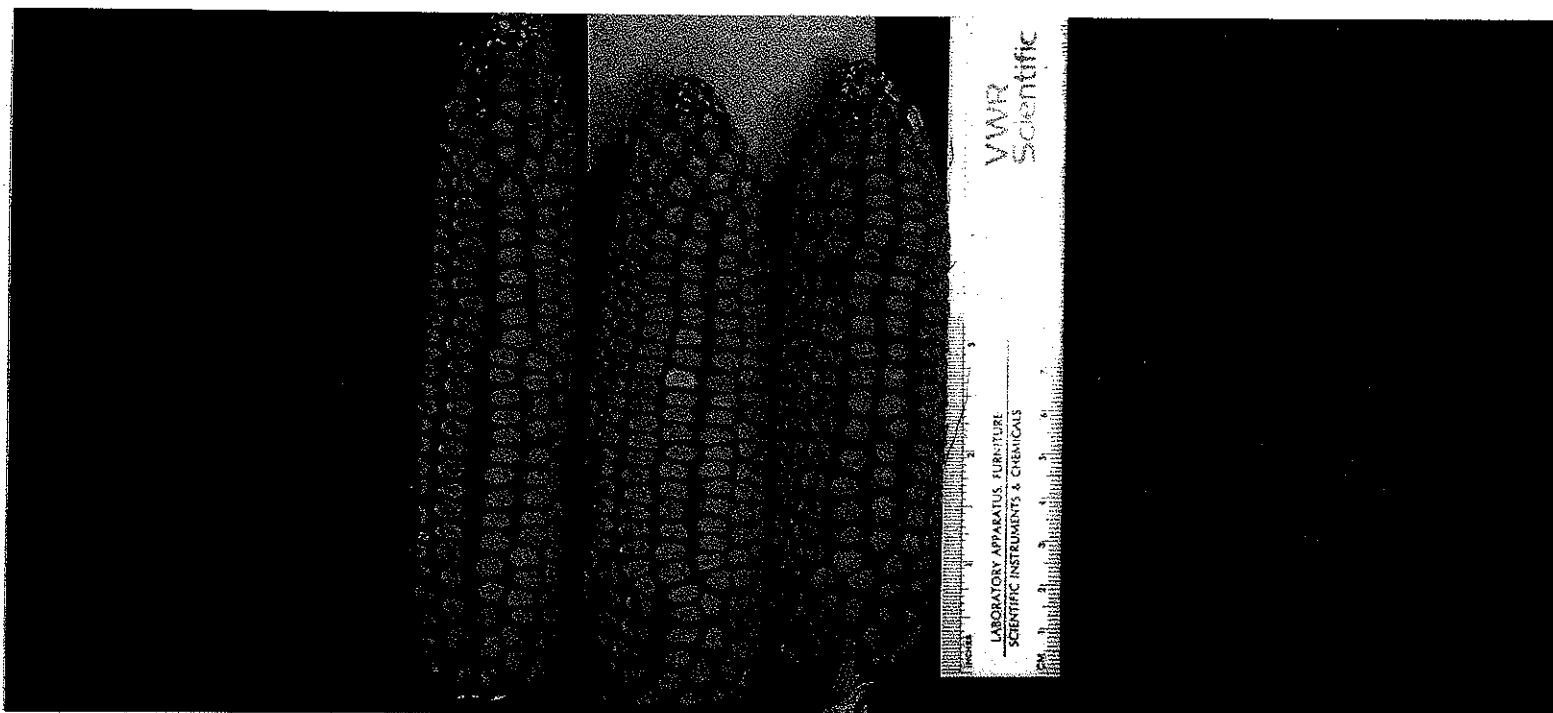
14D. Exhibit D. Additional Description of 'PHZ51' (continued)

b. Tassel



14D. Exhibit D. Additional Description of 'PHZ51' (continued)

c. Ear



14E. Exhibit E. Statement of Basis of Applicant's Ownership
of 'PHZ51'

Pioneer Hi-Bred International, Inc., Des Moines, Iowa, is the employer of the plant breeders involved in the development and evaluation of PHZ51. Pioneer Hi-Bred International, Inc. has the sole rights and ownership of PHZ51.